WHAT IS CLAIMED IS:

1. A magnetic memory comprising:

two or more memory layers and two or more tunnel layers that are stacked in a thickness direction of the layers,

wherein the two or more memory layers are connected electrically in series,

a group of first layers comprises at least one layer selected from the two or more memory layers,

a group of second layers comprises at least one layer selected from the two or more memory layers, and

a resistance change caused by magnetization reversal in the group of first layers differs from a resistance change caused by magnetization reversal in the group of second layers.

2. The magnetic memory according to claim 1, wherein the resistance change of the group of first layers is represented by ΔR_1 and the resistance change of the group of second layers is represented by ΔR_2, and

ΔR_1 and ΔR_2 satisfy

$\Delta R_1 \times 2 \leq \Delta R_2$

where $\Delta R_1 < \Delta R_2$.

3. The magnetic memory according to claim 1, comprising:

two or more magnetoresistive elements; and

two or more recording conductors,

wherein each of the two or more magnetoresistive elements comprises at least one layer selected from the two or more memory layers and at least one layer selected from the two or more tunnel layers, and

at least one recording conductor selected from the two or more recording conductors is arranged between a pair of adjacent magnetoresistive elements selected from the two or more magnetoresistive elements.

4. The magnetic memory according to claim 1, comprising:

a magnetoresistive element comprising at least two layers selected from the two or more memory layers,

wherein the at least two layers include two memory layers with

different resistance changes due to magnetization reversal.

5. The magnetic memory according to claim 1, wherein the two or more tunnel layers include two tunnel layers with different thicknesses.

6. The magnetic memory according to claim 1, wherein a resistance change of a Nth memory layer selected from the two or more memory layers is represented by ΔR_N, a minimum value of ΔR_N is represented by ΔR_{min}, and a maximum value of ΔR_N is represented by ΔR_{max}, and

ΔR_{min} and ΔR_{max} satisfy

$$\Delta R_{max} \geq \Delta R_{min} \times 2^{N-1}$$

where N is an integer of not less than 2.

7. The magnetic memory according to claim 1, wherein a resistance change of a Nth memory layer selected from the two or more memory layers is represented by ΔR_N and a Mth smallest ΔR_N is represented by ΔR_M, and

ΔR_M satisfies

$$\Delta R_M \times 2 \leq \Delta R_{M+1}$$

where N is an integer of not less than 2 and M is an integer of 1 to (N − 1).

8. The magnetic memory according to claim 1, wherein the two or more memory layers include a pair of memory layers that are adjacent to each other in the thickness direction of the layers so that a direction of an easy axis of magnetization of one of said pair of memory layers differs from a direction of an easy axis of magnetization of the other of said pair of memory layers.

9. The magnetic memory according to claim 8, wherein an angle between the easy axes of magnetization ranges from 20° to 90°.

10. The magnetic memory according to claim 8, wherein at least one of the pair of memory layers is a laminate that comprises two or more magnetic layers.

11. The magnetic memory according to claim 1, comprising:

a nonlinear element connected electrically to the two or more memory layers.

12. A magnetic memory device comprising a plurality of magnetic memories according to claim 1,

wherein the magnetic memories are arranged in an in-plane direction of the layers.

13. The magnetic memory device according to claim 12, comprising a pair of memory layers that are adjacent to each other in the in-place direction of the layers so that a direction of an easy axis of magnetization of one of said pair of memory layers differs from an direction of an easy axis of magnetization of the other of said pair of memory layers.

14. A system LSI comprising the magnetic memories according to claim 1.

15. A method for driving a magnetic memory comprising:

driving a magnetic memory comprising two or more memory layers and two or more tunnel layers that are stacked in a thickness direction of the layers, wherein the two or more memory layers are connected electrically in series, a group of first layers comprises at least one layer selected from the two or more memory layers, a group of second layers comprises at least one layer selected from the two or more memory layers, and a resistance change caused by magnetization reversal in the group of first layers differs from a resistance change caused by magnetization reversal in the group of second layers,

wherein magnetization reversal of at least one layer selected from the two or more memory layers is performed using a magnetic field that is produced by a plurality of currents including a current flowing through the at least one layer in its thickness direction.

16. The method according to claim 15, wherein the plurality of currents includes a second current, where the current flowing in the thickness direction is identified as a first current, and

the second current flows in an in-plane direction of the two or more memory layers and produces a magnetic field along a magnetization direction after the magnetization reversal.

17. The method according to claim 16, wherein application of the second current is started after application of the first current is started.

18. The method according to claim 17, wherein the plurality of currents further includes a third current that flows in the in-plane direction, but in a different direction from the second current, and

application of the second current is started after application of the third current is started.

19. The method according to claim 16, wherein the plurality of currents further includes a third current that flows in the in-plane direction, but in a different direction from the second current, and

the first current is supplied after separation from the third current.

20. The method according to claim 15, wherein magnetizations of two layers selected from the two or more memory layers are reversed simultaneously by application of at least a magnetic field produced by a current flowing through a conductor that lies between the two layers.

21. A method for driving a magnetic memory comprising:

driving a magnetic memory comprising a memory layer,

wherein magnetization reversal of the memory layer is performed using a magnetic field that is produced by a plurality of currents including a current flowing through the memory layer in its thickness direction.

22. The method according to claim 21, wherein the plurality of currents includes a second current, where the current flowing in the thickness direction is identified as a first current, and

the second current flows in an in-plane direction of the memory layer and produces a magnetic field along the a magnetization direction after the magnetization reversal.

23. The method according to claim 22, wherein application of the second current is started after application of the first current is started.

24. The method according to claim 23, wherein the plurality of currents further includes a third current that flows in the in-plane direction, but in a

different direction from the second current, and

application of the second current is started after application of the third current is started.

25. The method according to claim 22, wherein the plurality of currents further includes a third current that flows in the in-plane direction, but in a different direction from the second current, and

the first current is supplied after separation from the third current.